

CLAIMS

What is Claimed is:

1. An apparatus configured for analyzing a sample, the apparatus comprising:
 - a. a sensor configured for detecting emitted light from the sample;
 - b. a light source optically coupled to the sensor configured to illuminate the sample with an excitation light having a first wavelength; and
 - c. a matched filter optically coupled between the sample and the sensor for allowing substantially only the emitted light having a second wavelength to pass therethrough and strike the sensor.
2. The apparatus according to claim 1 wherein the sensor is a charge coupled device.
3. The apparatus according to claim 1 wherein the sensor is a two dimensional charge coupled device.
4. The apparatus according to claim 1 wherein the light source is a coherent light source such as a laser.
5. The apparatus according to claim 1 wherein the light source is a broad spectrum light source and the apparatus further comprising a secondary filter located between the broad spectrum light source and the sample such that substantially only the excitation light with the first wavelength reaches the sample.

1 6. The apparatus according to claim 1 further comprising a lens optically coupled
2 between the sample and the sensor for focussing the emitted light.

1 7. An apparatus configured for analyzing a biochip containing a tag labeled
2 sample, the apparatus comprising
3 a. a two dimensional CCD sensor for detecting emitted light from the tag
4 labeled sample on the biochip; and
5 b. a lens optically coupled between the two dimensional CCD sensor and
6 the biochip and configured to transmit the emitted light to the two
7 dimensional CCD sensor wherein the lens is configured to be within two
8 inches of the tag labeled sample.

1 8. The apparatus according to claim 7 further comprising a light source to
2 illuminate the tag labeled sample.

1 9. The apparatus according to claim 8 wherein the light source is a broad
2 spectrum light source.

1 10. The apparatus according to claim 8 further comprising a light source filter
2 configured to be optically coupled between the light source and the tag labeled sample
3 wherein the light source filter is configured to only substantially allow light waves
4 having an excitation wavelength corresponding to the tag labeled sample to reach the
5 tag labeled sample.

1 11. The apparatus according to claim 7 further comprising a sensor filter optically
2 coupled between the two dimensional CCD sensor and the lens wherein the sensor
3 filter is configured to only substantially allow light waves emitted from the tag labeled
4 sample to reach the CCD sensor.

1 12. A system configured to detect and locate fluorescently labeled samples on a
2 biochip, the biochip having a plurality of samples, the system comprising:
3 a. a light source configured to simultaneously illuminate all the
4 fluorescently labeled samples;
5 b. a two dimensional CCD sensor optically coupled to the light source and
6 configured for concurrently detecting and locating emitted light from the
7 fluorescently labeled samples on the biochip; and
8 c. a lens optically coupled between the light source and the two
9 dimensional CCD sensor and configured to appropriately magnify the
10 biochip onto the two dimensional CCD sensor.

1 13. A system configured to detect and locate a first set of samples labeled by a first
2 fluorescent tag and a second set of samples labeled by a second fluorescent tag, the
3 system comprising:

- 4 a. a light source configured to simultaneously illuminate all the
5 fluorescently labeled samples;
- 6 b. a two dimensional CCD sensor optically coupled to the light source and
7 configured for concurrently detecting and locating a first emitted light
8 from the first set of samples and a second emitted light from the second
9 set of samples; . .
- 10 c. a lens optically coupled between the light source and the two
11 dimensional CCD sensor and configured to transmit the first emitted
12 light and the second emitted light to the two dimensional CCD sensor;
- 13 d. a first light source filter selectively and optically coupled to the light
14 source and configured for substantially only transmitting a first
15 illuminating light to the first set of samples to excite the first set of
16 samples;
- 17 e. a first sensor filter selectively and optically coupled to the two
18 dimensional CCD sensor and configured for substantially only
19 transmitting the first emitted light to the two dimensional CCD sensor;
- 20 f. a second light source filter selectively and optically coupled to the light
21 source and configured for substantially only transmitting a second
22 illuminating light to the second set of samples to excite the second set
23 of samples; and
- 24 g. a second sensor filter selectively and optically coupled to the two
25 dimensional CCD sensor and configured for substantially only

transmitting the second emitted light to the two dimensional CCD sensor.

- 1 14. A method of detecting and locating a first sample labeled by a first fluorescent
2 tag and a second sample labeled by a second fluorescent tag wherein the first sample
3 and the second sample are on a biochip, the method comprising the following steps:
- 4 a. selectively exciting the first sample by substantially directing only light
5 having a first excitation wavelength for exciting the first fluorescent tag
6 from a broad spectrum light source to the first sample;
- 7 b. selectively detecting the first sample during the step of exciting the first
8 sample by substantially directing only light having a first emission
9 wavelength emitted by and from the first sample to a two dimensional
10 CCD sensor;
- 11 c. selectively exciting the second sample by substantially directing only
12 light having a second excitation wavelength for exciting the second
13 fluorescent tag from the broad spectrum light source to the second
14 sample; and
- 15 d. selectively detecting the second sample during the step of exciting the
16 second sample by substantially directing only light having a second
17 emission wavelength emitted by and from the second sample to the two
18 dimensional CCD sensor.

1 15. A method of detecting and locating a sample labeled with a fluorescent tag, the
2 method comprising the following steps:

- 3 a. illuminating the sample with a light source;
4 b. focussing an emitted light from the sample via a lens wherein the lens is
5 located at a distance that is less than 6.0 inches from the sample; and
6 c. detecting the emitted light from the sample via a CCD sensor.

1 16. The method according to claim 15 further comprising inserting a light source
2 filter adjacent to the light source wherein the light source filter is configured to
3 substantially block light waves that have wavelengths outside an excitation wavelength
4 range of the fluorescent tag from reaching the sample.

1 17. The method according to claim 15 further comprising inserting a sensor filter
2 adjacent to the CCD sensor wherein the sensor filter is configured to substantially
3 block light waves that have wavelengths outside an emission wavelength range of the
4 fluorescent tag from reaching the CCD sensor.

1 18. The method according to claim 15 wherein the CCD sensor comprises a two
2 dimensional array of charge coupled devices.

1 19. The method according to claim 15 wherein the light source is a broad spectrum
2 light source.